

SIG Working Group 2 Research

DAMAGES OF **SEGMENTAL LINING**



Società Italiana Gallerie
Italian Tunnelling Society

1 PREFACE

1.1 Introduction

Writing a report on “Damages of segmental lining” is one of the on-going activities of the International Tunnelling Association (ITA-AITES) Working Group 2 – Research, animated by Elena Chiriotti. The International Team Leader of this activity is Jon Hurt.

Aiming to contribute, in years 2016 – 2018 the Italian Tunnels Society - Società Italiana Gallerie (SIG) Working Group 2 - Research, under the coordination of Andrea Sciotti and animated by Enrico Maria Pizzarotti, has prepared the present draft report and submitted it to the ITA WG2 Animateur and to the International Team Leader, as technical core of a possible final report to be further developed.

In order to be reviewed by the ITA WG 2 members and go through the formal approval process of ITA, a conceptual and final agreement on the document should be achieved, through further discussion and meetings within ITA WG 2; moreover, the technical part of the report itself should be completed with the ancillary chapters (e.g. Preface, Glossary, List of Symbols and Abbreviations, Introduction, Scope, Concluding Remarks). The final report should also take advantage of the results of an international survey on the subject, which will constitute its possible Annexes (e.g. Case Studies, General Tendencies).

Nevertheless, after an independent evaluation of two experts, SIG decided to publish this draft report, in order to illustrate what done by the SIG WG 2.

The members of the SIG Working Group 2, to whom the SIG's thanks go, are: Chiara Agostini, Monica Barbero, Gustavo Bomben, Vincenza Floria, Federico Foria, Valeria Mainieri, Davide Merlini, Matteo Moja, Ludovica Pizzarotti, Giovanni Plizzari, Diego Sebastiani, Giovanni Tiberti, Giuseppe Vago, Alessandra Vecchiarelli.

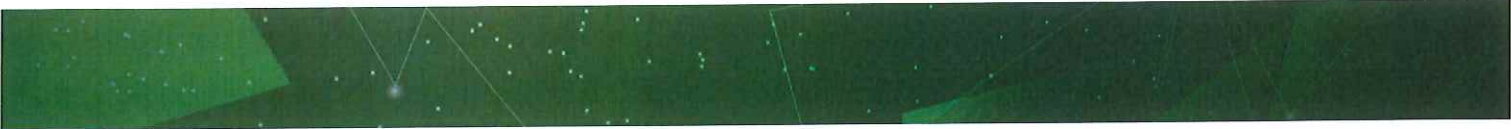
1.2 Scope

In the construction of underground infrastructures, the use of mechanised tunnelling faces a continuous increase; consequently, the production of precast segmental linings has become an increasingly important part of the tunnel industry. Therefore, guaranteeing high quality and performance of precast linings gets more and more crucial, both from the Project Owner and the Contractor points of view; in fact, the Owner of the infrastructure requires (and pays for) a tunnel free from defects and water-tight in the long-term, whereas the Contractor (and his potential Subcontractors) doesn't want to spend for replacing damaged segments, repairing defective segments or non performing rings after the erection, performing water-tightening injections, etc.

The aim of this draft report is providing an overview of the aspects that affect the quality of the precast segment's production and of the complete precast tunnel lining, thus equipping the parties involved in tunnel industry with a set of tools that can help to improve the segments' production and the precast lining quality, in terms of: quality control; types, causes, mitigation and repair of possible damages; appropriate design procedure; useful tests and checks, both preliminary and on the finished product.

References to the currently applicable standards and guidelines (Chapter 3) and of the principal bibliography (Chapter 8) on the topic are given. Specific indications on Quality Control procedures (Chapter 4), Type and Causes of damage, Mitigation and Repair actions (Chapter 5), Calculation Methods (Chapter 6) and On-Site and Laboratory Test and Checks (Chapter 7) are provided.

All the phases of the segment life, from factory production, transportation and delivery on site, installation, until handover and service life are considered.



Special attention is devoted to two different kinds of damage: non-structural driven damages, identified as technological damages (Paragraph 5.1), and structural driven damages (Paragraph 5.2, Chapter 6), related to the stress-response of segments and precast linings during the production.